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10/678,247	10/03/2003	Khosrow Lashkari	6655P003	2014

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EXAMINER	
SHAH, PARAS D	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/678,247	Applicant(s) LASHKARI ET AL.	
	Examiner Paras Shah	Art Unit 2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Application filed on 09/17/2007. The Applicants' amendment and remarks have been carefully considered, but they are moot in view of new grounds for rejection and do not place the claims in condition for allowance. Accordingly, this action has been made FINAL.

2. All previous objections and rejections directed to the Applicant's disclosure and claims not discussed in this Office Action have been withdrawn by the Examiner.

Change of Art Units

3. It should be note that the Examiner has changed art units, which was formerly 2609. The Examiner's new art unit is 2626.

Response to Arguments

4. Applicant's arguments (pages 13-16) filed on 09/17/2007 with regard to claims 1-33 have been fully considered but they are moot in view of new grounds for rejection.

Response to Amendment

5. Applicants' amendments filed on 09/17/2007 have been fully considered. The newly amended limitations in claims 1, 14, and 25 necessitate new grounds of rejection. The prior art reference by Lashkari *et al.* ("A new technique for joint optimization of excitation and model parameters in parametric speech coders (A)") has been applied to teach the "portioned roots".

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-4, 12-17, 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen *et al.* ("A New Algorithm for Parameter Re-Optimization", 2000) in view of Lashkari *et al.* ("A new technique for joint optimization of excitation and model parameters in parametric speech coders (A)").

As to claims 1,14, and 25 Chen *et al.* teaches

generating synthesized speech samples (see Abstract) (e.g. It is evident that in order to minimize the error between the original and synthesized speech, the synthesized speech must be generated), using a synthesis filter (see page 560, left column, sect I, lines 1-3), in response to an excitation signal (see page 560, left column, sect I, line 3 and lines 6-8);

determining a synthesis error between original speech samples and the synthesized speech samples (see Abstract); and

substantially reducing the synthesis error by computing both the excitation signal and filter parameters for the synthesis filter (see page 560, left column, sect I, lines 1-8), wherein substantially reducing the synthesis error comprises applying a gradient descent algorithm (see page 561, left column, sect II, last paragraph) to a polynomial (see page 561, left column, sect II, the equation on

the 2nd line) representing the synthesis error over a series of iterations (see page 561, left column, sect II, the equation on the 2nd line) (e.g. The summation bounds indicate that iterations must be performed to find the error over the bounds 1:N.), including computing a gradient of the synthesis error in terms of gradient vectors (see page 561, left column, sect II, last paragraph) of the synthesized speech samples by generating partial derivatives (see page 561, left column, sect II, equations 3, 4, and last paragraph), using a recursive algorithm (see page 561, left column, sect II, 3rd paragraph) , for terms of a polynomial representing the synthesized speech samples over a series of iterations (see page 561, left column, sect II, the equation on the 2nd line (e.g. The polynomial represents the synthesized and original speech. It is further noted that the subsequent equations shown in the reference perform partial derivatives with respect to the parameters (see equations 3 and 4)).

However, Chen *et al.* does not specifically teach the partitioning of roots.

Lashkari *et al.* does teach the partitioning of roots (see Page 2, lines 7-9) (e.g. From the cited section, a gradient descent is applied to the root domain. Further, it is obvious that the gradient decent is applied to the partitioned roots. The roots extracted from a polynomial can come in a partitioned set such as real and imaginary, negative and positive, just positive or just negative. Hence, a partition exists.)

It would have been obvious at the time the invention was made to have modified the reduction of speech synthesis error as taught by Chen *et al.* with

the application of the gradient descent to the partitioned roots of the polynomial as taught by Lashkari *et al.* The motivation to have use the roots is for reduction of synthesis error (see Lashkari *et al.* Abstract).

As to claims 2, 15, and 26, Chen *et al.* in view of Lashkari *et al.* teach all of the limitations as in claim 1, 14, and 25, above.

Furthermore, Lashkari *et al.* teaches reducing the synthesis error occurs in the root domain (see Abstract, line 7).

As to claims 3 and 16, Chen *et al.* in view of Lashkari *et al.* teach all of the limitations as in claim 1, 14, and 25, above.

Furthermore, Chen *et al.* teaches the use of a polynomial see page 561, left column, sect II, the equation on the 2nd line).

Furthermore, Lashkari *et al.* teaches the gradient search on the roots (see Abstract, line 7) (e.g. Since the gradient search is performed on the roots for the synthesis error, it is obvious that the roots are obtained from the synthesis error equation, which is a polynomial as noted by Chen *et al.*)

As to claims 4, 17, and 27, Chen *et al.* in view of Lashkari *et al.* teach all of the limitations as in claim 1, 14, and 25, above.

Furthermore, Lashkari *et al.* teaches the conversion of LPC to roots (see Abstract, lines 8-13) (e.g. From the cited sections it is obvious that the LPC

coefficients are converted into roots. Gradient search is performed on the LPC solution. Further, from the previous sentence, it is shown that the gradient search is performed in the root domain. Hence, it would have been obvious that the LPC solution is converted into roots, where the gradient search is then applied.).

As to claim 12, Chen *et al.* in view of Lashkari *et al.* teach all of the limitations as in claim 1, above.

Furthermore, Lashkari *et al.* teaches generating an excitation function (Abstract, lines 7-11).

However, Lashkari *et al.* does not specifically teach the generation of the excitation function.

It would have been obvious to one of ordinary skilled in the art that excitations are generated in order to produce a synthetic version of the speech signal for error minimization.

As to claims 13 and 24, Chen *et al.* in view of Lashkari *et al.* teach all of the limitations as in claim 12, above.

Furthermore, Lashkari *et al.* teaches generating an excitation function (Abstract, lines 7-11).

However, Lashkari *et al.* does not specifically teach the generation of the excitation using codebook values.

It would have been obvious to one of ordinary skilled in the art that excitations are generated using codebooks of possible excitations for excitation construction. Further, the Lashkari *et al.* reference suggests the incorporation of the synthesis error minimization in a CELP or parametric speech coders. Hence, it is obvious to one skilled in the art that excitations are generally constructed using pitch and gain codebooks.

As to claim 28, Chen *et al.* in view of Lashkari *et al.* teach all of the limitations as in claim 27, above.

Furthermore, Lashkari *et al.* teaches the generation of partial derivatives for each root of a polynomial representing the synthesized speech samples during an iteration in the series of iterations.

Furthermore, Chen *et al.* teaches) representing the synthesis error over a series of iterations (see page 561, left column, sect II, the equation on the 2nd line) (e.g. The summation bounds indicate that iterations must be performed to find the error over the bounds 1:N.)

8. Claims 5, 6, 8, 18, 19, 21, and 29-31 rejected under 35 U.S.C. 103(a) as being unpatentable over , Chen *et al.* in view of Lashkari *et al.* as applied to claim 1above, and further in view of Morris *et al.* ("Modification of Formants in the Line spectrum Domain", January 2002)..

As to claims 5,18, and 29, Chen *et al.* in view of Lashkari *et al.* teach reducing the synthesis error between original speech samples and synthesized speech using gradient descent algorithm (recursive algorithm) as applied in claim 1, above.

However, Chen *et al.* in view of Lashkari *et al.* does not specifically teach the computation of partial derivatives with respect to line spectrum pairs.

Morris *et al.* does teach the computation of partial derivatives representing speech with respect to line spectrum pairs (see page 19, equations 5-7 and equation 8).

It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have combined the reduction of synthesis error as taught by Chen *et al.* in view of Lashkari *et al.* with the use of partial derivative of the line spectral pair as presented by Morris *et al.* The motivation to have combined the two references involves LSP frequencies are commonly used in coding and are a representation of linear prediction coefficients (see page 19, right column, 2nd paragraph), which benefit the system taught by Chen *et al.* in view of Lashkari *et al.*, where the LSP coefficients are found from the original and synthesized speech.

As to claims 6, 19, and 30, Chen *et al.* in view of Lashkari *et al.* in view of Morris *et al.* teach all of the limitations as in claim 5, above.

Furthermore, Morris *et al.* teaches the LSPs comprise roots of a pair of polynomials (see page 19, equation 3 and 4) based on line spectrum frequencies (see page 19, right column, sect. II, part A., lines 10-11).

As to claims 8, 21, and 31, Chen *et al.* in view of Lashkari *et al.* in view of Morris *et al.* teach all of the limitations as in claim 5, above.

Furthermore, Chen *et al.* teaches the polynomial representing synthesized error (see page 561, left column, top equation. E is the synthesis error.).

Furthermore, Morris *et al.* does disclose the finding of the LSP from speech and being represented by a polynomial (see page 19, right column, equations 1-8 and page 20, equations above section b) (e.g. It should be noted that the error equation shown in Chen *et al.* is a function of the LP coefficients. Hence, the calculation of the LSPs error signal by the method as taught by Morris *et al.* would have been obvious to one skilled in the art.).

9. Claims 7, 20, 32, and 33 are rejected under 35 U.S.C. 103(a) as being obvious over Chen *et al.* in view of Lashkari *et al.* in view of Morris *et al.* as applied to claims 5 and 18, and 31 above, and further in view of Arslan *et al.* ("Voice Conversion by Codebook Mapping of Line Spectral Frequencies and Excitation Spectrum", 1997).

As to claims 7, 20, and 32, Chen *et al.* in view of Lashkari *et al.* in view of Morris *et al.* do not specifically teach the use of gradient descent to optimize LSP for the excitation signal to reduce error between the original and synthesized speech samples.

Arslan *et al.*, teaches the use of a gradient descent (see page 2, right column, lines 10-15) to optimize the LSF (see page 2, right column, lines 6-7 for the excitation signal (see page 1, right column, bottom two lines).

However, Arslan *et al.* does not specifically disclose the optimization of LSP.

It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have combined the teachings of Chen *et al.* in view of Lashkari *et al.* in view of Morris *et al.* with the use of the gradient descent algorithm for optimization on LSF and LSP as presented by Arslan *et al.* The motivation to have combined the two references involves the determination of the optimal set of weights that would represent the original speech spectrum (see Arslan *et al.* page 2, right column, lines 8-9). Further, since LSF and LSP are derived from the polynomial representing speech, it would be obvious to have optimized the LSF and LSP coefficients to closely model the original speech as stated above.

10. Claims 9-11, 22, and 23 are rejected under 35 U.S.C. 103(a) as being obvious over Chen *et al.* in view of Lashkari *et al.* and further in view of Chengalvarayan ("Use of Generalized Dynamic Feature Parameters for Speech Recognition")

As to claims 9 and 22, Chen *et al.* in view of Lashkari *et al.* teach all of the limitations as in claim 1, above.

However, Chen *et al.* in view of Lashkari *et al.* do not specifically teach the adjustment of the step size for the gradient descent algorithm to prevent overshooting the minimum error.

Chengalvarayan does teach the adjustment of the step size for the gradient descent algorithm to prevent overshooting the minimum error (see page 235, left column, sect. B, the optimization algorithm, last 8 lines) (e.g. The gradient descent algorithm is used an the step sizes are adjusted based on learning desired and to converge at a desired minimum.)

It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have modified the reduction of synthesis error as taught by Chen *et al.* in view of Lashkari *et al.* with the adjustment of the step size as taught by Chengalvarayan for the purpose of preventing unstable behavior and reaching a desired minimum (see Chengalvarayan 235, left column, sect. B, the optimization algorithm, last 8 lines). The latter reference solves the purpose of preventing instability.

As to claims 10 and 23, Chen *et al.* in view of Lashkari *et al.* in view of Chengalvarayan teach all of the limitations as in claim 9, above.

Furthermore, Chengalvarayan teaches the use of previous vectors from a previous iteration using a smaller step size if use of the current iteration causes the synthesis filter to become unstable (see Chengalvarayan 235, left column, sect. B, the optimization algorithm, last 8 lines) (e.g. From the cited section, the

step size is chosen empirically in order to choose a step size that will create an unstable result. Hence, from the use of empirical techniques it is obvious that the previous behavior is taken into consideration for determining current step sizes.).

As to claim 11, Chen *et al.* in view of Lashkari *et al.* in view of Chengalvarayan teach all of the limitations as in claim 9, above.

Furthermore, Chengalvarayan teaches adjusting the step size until the synthesis filter regains stability (see Chengalvarayan 235, left column, sect. B, the optimization algorithm, last 8 lines) (e.g. From the cited section, the step size is chosen empirically in order to choose a step size that will create an unstable result. Hence, from the use of empirical techniques it is obvious that the previous behavior is taken into consideration for determining current step sizes.).

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paras Shah whose telephone number is (571)270-1650. The examiner can normally be reached on MON.-THURS. 7:00a.m.-4:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached on (571)272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

P.S.
11/08/2007

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